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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/708,664	03/18/2004	Min-Lung Huang	10545-US-PA	2663

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ROOSEVELT ROAD, SECTION 2
TAIPEI, 100
TAIWAN

EXAMINER

GRAYBILL, DAVID E

ART UNIT	PAPER NUMBER
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2822

NOTIFICATION DATE	DELIVERY MODE
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10/03/2007

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

USA@JCIPGROUP.COM.TW

Office Action Summary

Application No.

10/708,664

Applicant(s)

HUANG ET AL.

Examiner

David E. Graybill

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 July 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6,8-13,15-17,22 and 23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6,8-13,15-17,22 and 23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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The drawings are conditionally objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the feature of claims 1 and 8, "wherein the wetting-barrier layer is a nickel post," must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

To further clarify, this objection is conditional on any assertion by applicant that the figures do now show the claimed post, such as the amendment to the specification filed on 7-13-7.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be

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labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

The amendment filed 7-13-7 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is the language, "(not shown in FIG. 2)." To further clarify, in the specification at paragraph 27, applicant discloses, "If the wetting-barrier layer is thick enough, it may be a wetting-barrier post." However, applicant does not further define the vague relative language "thick enough." Therefore, FIG. 2 discloses that wetting-barrier 226 may be a wetting-barrier post because it is thick enough. Moreover, FIG. 2 is not drawn to scale so the thickness corresponding to the language "thick enough" is depicted in FIG. 2.

Applicant is required to cancel the new matter in the reply to this Office Action.

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The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –
(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-5, 8-12, 15-17, 22 and 23 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Kung (20030222352).

At paragraphs 6-9, 13, 15, 24-26 and 43 Kung discloses the following:

Re claim 1: An under bump metallurgy layer, between a bonding pad of a chip and a bump, for improving adhesion between the bonding pad and the bump, comprising: an adhesion layer 102, disposed on the bonding pad 16; a barrier layer 104, disposed on the adhesion layer; and a wetting-barrier layer 106, disposed on the barrier layer and between the barrier layer and the bump 18, wherein the wetting-barrier layer is a nickel post and directly contacts the bump while the bump comprises tin material and the bump is disposed on the wetting-barrier layer and the wetting-barrier layer covers an upper surface of the barrier layer.

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Re claim 2: The under bump metallurgy layer of claim 1, wherein a material of the adhesion layer is selected from the following group consisting of titanium (Ti), titanium-tungsten (Ti-W) alloy, chromium (Cr), titanium nitride (TiN), tantalum nitride (TaN), tantalum (Ta), aluminum (Al) and copper (Cu).

Re claim 3: The under bump metallurgy layer of claim 1, wherein a material of the adhesion layer is selected from the following group consisting of titanium, titanium-tungsten alloy, chromium, titanium nitride, tantalum nitride, tantalum and aluminum, and the bonding pad is made of aluminum.

Re claim 4: The under bump metallurgy layer of claim 1, wherein a material of the adhesion layer is selected from the following group consisting of titanium, titanium-tungsten alloy, chromium, titanium nitride, tantalum nitride, tantalum and copper, and the bonding pad is made of copper.

Re claim 5: The under bump metallurgy layer of claim 1, wherein a material of the barrier layer comprises nickel-vanadium alloy.

Re claim 8: A "flip chip" structure, comprising: a chip having an active surface, a passivation layer 14 and a plurality of bonding pads, wherein the bonding pads are disposed on the active surface and the passivation layer are disposed on the active surface exposing the bonding pads; an under bump metallurgy layer, wherein the under bump metallurgy layer

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comprising: an adhesion layer, disposed on the bonding pad; a barrier layer, disposed on the adhesion layer; and a wetting-barrier layer, disposed on the barrier layer, wherein the wetting-barrier layer is a nickel post and wherein the wetting-barrier layer covers an upper surface of the barrier layer; and a bump, disposed on the wetting barrier layer with direct contact.

Re claim 9: The flip chip structure of claim 8, wherein a material of the adhesion layer is selected, from the following group consisting of titanium (Ti), titanium-tungsten (Ti-W) alloy, chromium (Cr), titanium nitride (TiN), tantalum nitride (TaN), tantalum (Ta), aluminum (Al) and copper (Cu).

Re claim 10: The flip chip structure of claim 8, wherein a material of the adhesion layer is selected from the following group consisting of titanium, titanium-tungsten alloy, chromium, titanium nitride, tantalum nitride, tantalum and aluminum, and the bonding pad is made of aluminum.

Re claim 11: The flip chip structure of claim 8, wherein a material of the adhesion layer is selected from the following group consisting of titanium, titanium-tungsten alloy, chromium, titanium nitride, tantalum nitride, tantalum and copper, and the bonding pad is made of copper.

Re claim 12: The flip chip structure of claim 8, wherein a material of the barrier layer comprises nickel-vanadium alloy.

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Re claim 15: The flip chip structure of claim 8, wherein a material of the bump is made of tin-silver-copper alloy.

Re claim 16: The flip chip structure of claim 8, wherein a material of the bump is made of tin-copper alloy.

Re claim 17: The flip chip structure of claim 8, wherein a material of the bump is tin.

Re claim 22: The under bump metallurgy layer of claim 1, wherein the wetting-barrier layer is within the barrier layer to cover the upper surface thereon.

Re claim 23: The under bump metallurgy layer of claim 8, wherein the wetting-barrier layer is within the barrier layer to cover the upper surface thereon.

To further clarify, Kung discloses wherein the wetting-barrier layer is a post at least because the layer 106 is a metallic fitting attached to an electrical device (as a storage battery) for convenience in making connections. In any case, in the specification at paragraph 27, applicant discloses, "If the wetting-barrier layer is thick enough, it may be a wetting-barrier post. For example, a nickel post disposed on the barrier layer may be provided." Therefore, the layer 106 is also a post because it is thick enough.

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To further clarify,

37 CFR 1.84(p)(4) states:

The same part of an invention appearing in more than one view of the drawing must always be designated by the same reference character, and the same reference character must never be used to designate different parts.

Therefore, reference character 18 of Kung designates the same part in the embodiments of FIG. 1 and FIGS. 2A – 4H. In addition, Kung discloses that the material of the bump 18 in FIGS. 2A – 4H is made of tin-silver-copper alloy or tin-copper alloy. Therefore, Kung discloses that the material of the bump 18 in FIG. 1 is made of tin-silver-copper alloy or tin-copper alloy.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point

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out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

In the alternative, claims 1-5, 8-12, 15-17, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kung (20030222352).

Kung is applied as it is applied supra.

However, Kung does not appear to explicitly disclose wherein the wetting-barrier layer is a post.

Nonetheless, in the specification at paragraph 27, applicant discloses, "If the wetting-barrier layer is thick enough, it may be a wetting-barrier post." Moreover, as reasoned from well established legal precedent, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose this particular layer dimension because applicant has not disclosed that, in view of the applied prior art, the dimension is for a particular unobvious purpose, produces an unexpected result, or is otherwise critical. For that matter, applicant has not disclosed that the dimension is for **any** purpose or produces **any** result. Moreover, it appears prima facie that the process would possess utility using another dimension. Indeed, it

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has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

Also, although Kung does not appear to explicitly disclose that the material of the bump 18 in FIG. 1 is made of tin-silver-copper alloy or tin-copper alloy, Kung discloses that the material of the bump 18 in FIG. 1 is made of lead-tin alloy and that lead-tin alloy and tin-silver-copper alloy or tin-copper alloy are alternatives and equivalents; therefore, as reasoned from well established legal precedent, it would have been obvious to substitute or combine the tin-silver-copper alloy or tin-copper alloy of Kung for or with the lead-tin alloy of Kung. See *In re May* (CCPA) 136 USPQ 208 (It is our opinion that the substitution of Wille's type seal for the cement of Hallauer in Figure 1 would be obvious to persons of ordinary skill in the art from the disclosures of these references, merely involving an obvious selection between known alternatives in the art and the application of

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routine technical skills.); KSR International Co. v. Teleflex Inc., 82 USPQ2d 1385 (U.S. 2007); In re Cornish (CCPA) 125 USPQ 413; In re Soucy (CCPA) 153 USPQ 816; Sabel et al. v. The Wickes Corporation et al. (DC SC) 175 USPQ 3; Ex parte Seiko Koko Kabushiki Kaisha Co. (BdPatApp&Int) 225 USPQ 1260; and Ex parte Rachlin (BdPatApp&Int) 151 USPQ 56. See also Smith v. Hayashi, 209 USPQ 754 (Bd. of Pat. Inter. 1980) (However, there was evidence that both phthalocyanine and selenium were known photoconductors in the art of electrophotography. "This, in our view, presents strong evidence of obviousness in substituting one for the other in an electrophotographic environment as a photoconductor." 209 USPQ at 759.). An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. In re Fout, 675 F.2d 297, 213 USPQ 532 (CCPA 1982). "It is prima facie obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose.... [T]he idea of combining them flows logically from their having been individually taught in the prior art." In re Kerkhoven, 626 F.2d 846, 850, 205 USPQ 1069, 1072 (CCPA 1980) (citations omitted). See also In re Crockett, 279 F.2d 274, 126 USPQ 186

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(CCPA 1960); Ex parte Quadranti, 25 USPQ2d 1071 (Bd. Pat. App. & Inter. 1992).

Claims 6 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kung (20030222352).

In the embodiment wherein the wetting-barrier layer is nickel Kung does not appear to explicitly disclose the following:

Re claim 6: The under bump metallurgy layer of claim 1, wherein the under bump metallurgy layer further comprises an anti-oxidation layer and the anti-oxidation layer is disposed between the wetting-barrier layer and the bump.

Re claim 13: The flip chip structure of claim 8, wherein the under bump metallurgy layer further comprises an anti-oxidation layer and the anti-oxidation layer is disposed between the wetting-barrier layer and the bump.

Nonetheless, in the embodiment wherein the wetting-barrier layer is copper Kung discloses wherein the under bump metallurgy layer further comprises an anti-oxidation "oxidation resistant" layer and the anti-oxidation layer is disposed between the wetting-barrier layer and the bump.

Moreover, Kung discloses that the purpose of the anti-oxidation layer is to prevent surface oxidation. Therefore, it would have been obvious to try the

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anti-oxidation layer in the embodiment wherein the wetting-barrier layer is nickel in an attempt to obtain the same benefit of preventing surface oxidation. See *Pfizer Inc. v. Apotex Inc.*, 82 USPQ2d 1852 (Fed. Cir. 2007); *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385 (U.S. 2007).

In the alternative, claims 6 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kung as applied to claims 6 and 13 *supra*, and further in combination with Petit (6399475).

In the embodiment wherein the wetting-barrier layer is nickel Kung does not appear to explicitly disclose the following:

Re claim 6: The under bump metallurgy layer of claim 1, wherein the under bump metallurgy layer further comprises an anti-oxidation layer and the anti-oxidation layer is disposed between the wetting-barrier layer and the bump.

Re claim 13: The flip chip structure of claim 8, wherein the under bump metallurgy layer further comprises an anti-oxidation layer and the anti-oxidation layer is disposed between the wetting-barrier layer and the bump.

Nonetheless, at column 2, line 54 to column 3, line 5, Petit discloses wherein the under bump metallurgy layer further comprises an anti-oxidation layer 4 and the anti-oxidation layer is disposed between the nickel

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wetting-barrier layer 3 and the bump 5. Moreover, it would have been obvious to combine this disclosure of Petit with the disclosure of Kung because it would prevent surface oxidation of the wetting-barrier layer of Kung.

Applicant's remarks filed 7-13-7 have been fully considered and are adequately addressed by the rejections supra.

The art made of record and not applied to the rejection is considered pertinent to applicant's disclosure. It is cited primarily to show inventions relevant to the examination of the instant invention.

For information on the status of this application applicant should check PAIR:

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Alternatively, applicant may contact the File Information Unit at (703) 308-2733. Telephone status inquiries should not be directed to the examiner. See MPEP 1730VIC, MPEP 203.08 and MPEP 102.

Any other telephone inquiry concerning this communication or earlier communications from the examiner should be directed to David E. Graybill at (571) 272-1930. Regular office hours: Monday through Friday, 8:30 a.m. to 6:00 p.m.
The fax phone number for group 2800 is (571) 273-8300.

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A handwritten signature in black ink, appearing to read 'D. E. Graybill', is positioned above the printed name.

David E. Graybill
Primary Examiner
Art Unit 2822

D.G.
26-Sep-07